

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A process for producing a silica-based film, the process comprising

applying directly on a semiconductor device a film comprising at least one siloxane compound; and

irradiating a the film comprising at least one siloxane compound with electron beams at an irradiation dose of from 1 to 200 μ C/cm² to thereby convert the film into a film having a dielectric constant of 3 or lower and having react the siloxane compound throughout the film and generate silicon carbide bonds represented by Si-C-Si while maintaining the dielectric constant of the film at a value of 3 or lower, wherein

the siloxane compound is a product obtained from at least one compound selected from the group consisting of

compounds represented by the following formula (1):



where R¹ represents a monovalent organic group or a hydrogen atom; R² represents a monovalent organic group; and a is an integer of 0 to 2, and

compounds represented by the following formula (2):



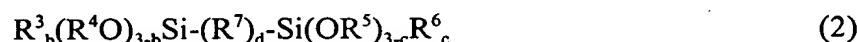
where R³, R⁴, R⁵, and R⁶ may be the same or different and each represents a monovalent organic group; b and c may be the same or different and each is an integer of 0 to 2; R⁷ represents an oxygen atom or a group represented by -(CH₂)_n-, where n is 1 to 6; and d is 0 or 1.

Claim 2 (Original): The process as claimed in claim 1, wherein the silica-based film has a dielectric constant of 2.8 or lower.

Claim 3 (Currently Amended) The process as claimed in claim 1, wherein the siloxane compound is a product of the hydrolysis and/or condensation of at least one compound selected from the group consisting of compounds represented by the following formula (1):



wherein where R^1 represents a monovalent organic group or a hydrogen atom; R^2 represents a monovalent organic group; and a is an integer of 0 to 2, and compounds represented by the following formula (2):



wherein where R^3 , R^4 , R^5 , and R^6 may be the same or different and each represents a monovalent organic group; b and c may be the same or different and each is an integer of 0 to 2; R^7 represents an oxygen atom or a group represented by $-(CH_2)_n-$, where n is 1 to 6; and d is 0 or 1.

Claim 4 (Canceled)

Claim 5 (Currently Amended): The process as claimed in claim 1, wherein the film comprising a at least one siloxane compound has a thickness of from 0.05 to 3 μm .

Claim 6 (Previously Presented): The process as claimed in claim 1, wherein the electron beam irradiation is conducted at an energy of from 0.1 to 50 keV.

Claim 7 (Original): The process as claimed in claim 1, wherein the electron beam irradiation is conducted at 25 to 500°C.

Claim 8 (Original): The process as claimed in claim 1, wherein the electron beam irradiation is conducted in an atmosphere having an oxygen concentration of 10,000 ppm or lower.

Claim 9 (Original): The process as claimed in claim 1, wherein the electron beam irradiation is conducted in an inert gas atmosphere.

Claim 10 (Original): The process as claimed in claim 1, wherein the electron beam irradiation is conducted at 133.3 Pa or lower.

Claim 11 (Currently Amended): The process as claimed in claim 1, wherein the film comprising ~~a~~ at least one siloxane compound is heat-cured at 300 to 500°C before being subjected to the electron beam irradiation.

Claim 12 (Original): A silica-based film obtained by the process as claimed in claim 1.

Claim 13 (Original): The silica-based film as claimed in claim 12, which has a carbon content of from 5 to 17% by mole.

Claim 14 (Original): A low-dielectric film comprising the silica-based film as claimed in claim 12.

Claims 15-16 (Canceled)

Claim 17 (Previously Presented): The process as claimed in claim 1, wherein the electron beam irradiation is conducted in an atmosphere having an oxygen concentration of 1,000 ppm or lower.

Claim 18 (New): The process as claimed in claim 1, wherein the film comprising at least one siloxane compound is applied directly on the semiconductor device by chemical vapor deposition.

Claim 19 (New): The process as claimed in claim 1, wherein the semiconductor device comprises at least one member of the group consisting of silicon, SiO₂ and SiN.

Claim 20 (New): A process for producing a silica-based film, the process comprising providing a substrate comprising a material selected from the group consisting of elemental Si, SiO₂ and SiN;

applying directly on the substrate a film comprising at least one siloxane compound; and

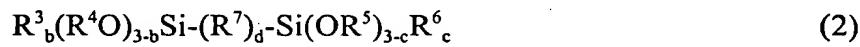
irradiating the film comprising at least one siloxane compound with electron beams at an irradiation dose of from 1 to 200 μ C/cm² to thereby react the siloxane compound throughout the film and convert the siloxane to form silicon carbide bonds represented by Si-C-Si while maintaining the dielectric constant of the film at a value of 3 or lower, wherein the siloxane compound is a product obtained from at least one compound selected from the group consisting of

compounds represented by the following formula (1):



where R¹ represents a monovalent organic group or a hydrogen atom; R² represents a monovalent organic group; and a is an integer of 0 to 2, and

compounds represented by the following formula (2):



where R³, R⁴, R⁵, and R⁶ may be the same or different and each represents a monovalent organic group; b and c may be the same or different and each is an integer of 0 to 2; R⁷ represents an oxygen atom or a group represented by -(CH₂)_n-, where n is 1 to 6; and d is 0 or 1.

SUPPORT FOR THE AMENDMENTS

This Amendment cancels Claims 4 and 15; amends Claim 1, 3, 5 and 11; and adds new Claims 18-20. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 1 is found in Claim 3 and in the specification at least at page 28, lines 6-10 ("the silica-based film is useful in applications such as ... protective films such as surface coat films for *semiconductor devices*"). The term "device" is defined as "an electronic element that cannot be divided without destroying its stated function; commonly applied to active elements such as transistors and transducer". See, e.g., McGraw-Hill Dictionary of Scientific and Technical Terms, 5th edition, page 553, copy attached. Additional support for Claim 1 is found in the specification at page 26, lines 9-10 ("...when the electron beam irradiation is conducted in an irradiation dose of from 1 to 1000 $\mu\text{C}/\text{cm}^2$, the siloxane compound can be reacted *throughout* the coating film ...") and page 36, Table 4 (electron beam irradiation while maintaining the dielectric constant k at a value of 3 or lower). Support for new Claim 18 is found in the specification at least at page 1, line 12 ("CVD") and page 25, lines 15-16. Support for new Claim 19 is found in the specification at least at page 25, lines 13-15 ("Examples of the substrate ... include silicon wafers, SiO_2 , wafers, and SiN wafers"). Support for new Claim 20 is found in Claim 1, as amended, and in the specification at least at page 25, lines 13-15. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-3, 5-14 and 17-20 will be pending in this application. Claims 1 and 20 are independent.